

# Unmanned Aerial Systems



## Quality As Well As Quantity

Captain Kyle Greenberg, U.S. Army

In APRIL 2008, Secretary of Defense Robert Gates addressed the Air War College at Maxwell Air Base and lauded the introduction of unmanned aerial systems into the Air Force arsenal as a less risky and more versatile intelligence, surveillance, and reconnaissance asset. He prodded the Air Force to provide more unmanned aerial systems in the Iraq and Afghanistan theaters of operation and asked Air Force officers to rethink which missions unmanned aviation assets could gradually assume from manned aviation assets.<sup>1</sup>

At the time of the secretary's speech, I was a Shadow unmanned aerial systems platoon leader for a brigade combat team deployed in support of Operation Iraqi Freedom. Although I took pride in the Nation's civilian military leader promoting the area for which my Soldiers deployed to combat, I wondered why the secretary felt we needed more unmanned aerial systems. I thought that rather than purchasing more systems, the Army and the Air Force should make more of an effort to improve the planning and execution of missions for unmanned aerial systems that already exist.

Troubles with unmanned aerial systems employment have not gone unnoticed. Since 2005, the U.S. Government Accountability Office (GAO) has produced multiple reports recommending that the Department of Defense (DOD) improve various aspects of unmanned aerial systems operations. The GAO geared the majority of these reports toward improving joint interoperability of unmanned aerial systems, adjusting acquisition plans for future unmanned aerial systems, and ensuring safe expansion of unmanned aerial systems into national airspace.<sup>2</sup> However, one report, *Unmanned Aircraft Systems: Advanced Coordination and Increased Visibility Needed to Optimize Capabilities*, aimed to improve the planning and execution of combat operations.<sup>3</sup> This report recommended that the DOD develop qualitative and quantitative metrics to measure the effectiveness of unmanned aerial system coverage for troops on the ground. The same report also recommended that DOD develop a systematic process to capture feedback from intelligence and operations communities to assess how effectively intelligence, surveillance, and reconnaissance assets were meeting warfighters' requirements.

The department has relied on organizations such as the Center for Army Lessons Learned to obtain feedback on unmanned aerial systems operations

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PHOTO: An RQ-4 Global Hawk soars through the skies to record intelligence, surveillance, and reconnaissance data. Because of its large coverage area, the Global Hawk has become a useful tool for recording data and sending it to warfighters on the ground. (Courtesy of U.S. Air Force)

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and stood up an intelligence, surveillance, and reconnaissance assessment division to develop metrics for such operations. However, the metrics the assessment division developed are predominately quantitative and do not encompass missions flown by tactical unmanned aerial systems, which often collect imagery in support of division and corps level operations.<sup>4</sup>

My personal observations at the division and brigade levels made me believe that measures the department implemented because of GAO recommendations were not effective in improving unmanned aerial systems employment from the warfighter's perspective. I did not observe any metrics measuring the effectiveness of unmanned aerial systems coverage from Shadow platoons nor did I see any consistent, immediate feedback between brigades and battalions requesting unmanned aerial systems coverage and the unmanned aerial systems operators who performed a particular mission.

The reality was that most of my platoon's missions in Iraq were repetitive and not adequately synchronized with the current operations and intelligence situation. My platoon flew the same missions day after day, and so did many of the higher-echelon unmanned aerial systems supporting our brigade. My platoon received feedback only through direct,

informal communication between the platoon's leaders and the ground commanders who requested unmanned aerial systems coverage. The lack of progress in using unmanned aerial systems at the division and brigade level has encouraged me to recommend ways to improve the planning and execution of such missions. Although the Army will soon begin to withdraw forces from the Iraq theater of operations, the lessons to learn from unmanned aerial systems operations during this conflict could significantly help troops in Afghanistan and in future asymmetric conflicts.

## Observations

Each morning of the deployment, I asked my Soldiers which missions we needed to accomplish in the next 24 hours. Most of my questions elicited a similar response: "The same missions we've flown for the past month." The intelligence, surveillance, and reconnaissance target decks, which are tables of the named routes and tactical areas of interest for the systems to observe during a particular mission, rarely changed from day to day despite intelligence updates from the brigade intelligence officer (S2). Subordinate units seldom updated their target decks so the systems could either confirm or deny the most recent intelligence gaps or provide direct overwatch for maneuver units in offensive operations.



Photo by SSG Charles Wesson

A Shadow unmanned aerial system vehicle launches to conduct a surveillance mission, in Baghdad, Iraq.



U.S. Air Force, SSGT Bennie J. Davis II

**SSGT Ryan Conversi**, a dedicated crew chief for the RQ-4 Global Hawk, prepares the unmanned aircraft system for launch using the vehicle test controller (VTC) while reviewing technical orders. SSGT Conversi is a member of the 12th Reconnaissance Squadron, Beale Air Force Base, Calif.

My platoon sergeant and my platoon's unmanned aerial systems technician assisted me tremendously in our efforts to work with brigade and battalion intelligence shops to seek out missions that would benefit from our Shadow platoon's imagery collection and aerial communications retransmission capabilities. We achieved success on a case-by-case basis. We convinced units to retask the unmanned aerial systems to support offensive operations in search of high-value individuals, and we sometimes persuaded units to use the unmanned aerial systems to collect imagery of areas unfamiliar to troops on the ground. However, too often we found that when we did not prod a unit to improve its intelligence, surveillance, and reconnaissance planning, our missions would revert to their normal, repetitive nature.

The problem of optimizing the effectiveness of unmanned aerial systems in theater was not just a local phenomenon. While visiting a nearby corps-level unmanned aerial systems battalion, I heard similar complaints from operators and saw many of the same intelligence, surveillance, and reconnaissance target decks that my platoon used. Even the more expensive and more robust unmanned aerial systems, such as the Hunter and the Sky Warrior, performed many of the same missions day after day with little guidance on what to confirm or deny. It was clear that assets were not being used to their full potential and that S2

sections and combat leaders were not maximizing their abilities to collect actionable intelligence for their formations.

The most common problem was the propensity of maneuver units to task unmanned aerial systems to observe the same routes and the same named areas of interest each day. One particularly disturbing trend was that battalion intelligence officers often used unmanned aerial systems to detect and report improvised explosive devices (IEDs) during route reconnaissance missions. No imagery-collection unmanned aerial system, whether Raven, Shadow, Hunter, Predator, or any other asset, will have success observing IEDs on a regular basis. Even observing personnel emplacing IEDs is very difficult to do. It requires the unmanned aerial systems to be in the right place at the exactly the right time and the owning ground unit to apprehend individuals suspected of emplacing IEDs.

Having unmanned aerial systems repeatedly observe identical named areas of interest produced similar lackluster results. On the rare occasions when the unmanned aerial system observed seemingly "suspicious" activity, the unit requesting coverage decided whether to act. Some potentially criminal actions went unchecked when units were unable or unwilling to respond to unmanned aerial system reports. Likewise, whether performing a route reconnaissance or an observation mission,

neither the unmanned aerial systems platoon nor the supported unit observed and analyzed the coverage carefully enough to establish enemy patterns of behavior or significant changes in the landscape suggesting enemy activity. We typically tasked unmanned aerial systems to conduct route reconnaissance and named area of interest observance missions at the expense of better uses for imagery collection platforms.

The trend of units submitting identical or similar target decks on a regular basis came about because brigades and battalions wanted to maximize unmanned aerial systems coverage to increase the likelihood of having a system in their area of operations in the event of significant, unexpected enemy activity. This sort of “just-in-case” theory is logical. An unmanned aerial system should always be prepared to dynamically retask to provide imagery of critical events, such as troops in contact with the enemy or troops searching for a time-sensitive target. However, this “just in case” use of the systems is also risky because requiring unmanned aerial system units to provide continuous coverage significantly strains their manpower, maintenance, and logistical capacities. In other words, the Army cannot afford that kind of redundancy.

The Shadow, for example, was only meant to provide 12 hours of on-target coverage per 24-hour period. The Hunter can support an operational tempo of 12 hours of daily coverage for six days, followed by a maintenance day of zero flight hours.<sup>5</sup> Exceeding these limits increases the likelihood of a mishap due to mechanical failure from overuse of the systems or even a mishap due to human error by overworked pilots and mechanics. Good leaders and dedicated Soldiers can mitigate most of the human and mechanical risks associated with increased coverage, but no commander wants to be responsible for a mishap that occurred while the system was only flying “just in case” something happened.

Admittedly, increasing the number of unmanned aerial systems in theater will allow units to receive more coverage with less strain on resources, but

it will not necessarily improve the overall effectiveness of systems employment. In a large city, for example, airspace restrictions alone prevent unmanned aerial systems from being able to constantly observe every potential intersection or suspected enemy hideout. Units must establish a method for disseminating information to systems operators so that they know where to look and when. Rather than submitting identical target decks each day, units should task the systems to fly missions only to confirm or deny the presence of persons, events, or activities within named areas of interest that are tailored to the current operational and intelligence situation.

In addition, some units that displayed a willingness to synchronize their target decks with current operations did not always have the ability to do so because the process for requesting coverage was so time-consuming. The process had to be complete 72 to 96 hours prior to the actual unmanned aerial systems coverage time, in large part due to the planning cycle at the corps and division level. Units were not likely to submit a target deck that reflected the current intelligence situation if they could not be certain which operations were going to take place four days in advance. Considering commanders’ desires to keep unmanned aerial systems in the air and the difficulty of predicting three to four days in advance which operations would require unmanned aerial systems coverage, it is not hard to understand why commanders typically emphasize the quantity of intelligence, surveillance, and reconnaissance coverage much more than its quality.

## Short-Term Recommendations

To make intelligence, surveillance, and reconnaissance quality just as important as quantity, Army commanders at the division level and below should focus on three areas. First, they must repeatedly stress to their intelligence sections

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Photo by Author

A soldier inspects a Shadow unmanned aerial system prior to launch.

the importance of continually updating intelligence, surveillance, and reconnaissance target decks to reflect the current operations and intelligence situation. Second, collection managers must work with unmanned aerial systems leaders to determine how to simplify the target decks and enable battalions to submit coverage requests 24 hours before missions so that, with the exception of dynamic retasks, they can finalize the target decks 12 hours later. Third, Army and Air Force unmanned aerial systems leaders must educate leaders and staff officers on systems capabilities and limitations and establish a system of feedback between aerial systems leaders and supported units to improve the planning and execution of such operations.

The most effective way to counter scanning the same routes and collecting on the same areas of interest day after day is for commanders to ensure that collection managers update intelligence, surveillance, and reconnaissance target decks to reflect the current operations and intelligence situation. Throughout each 24-hour period, divisions and brigades will receive information from signals intelligence, human intelligence, and the Joint surveillance and

target attack radar system moving target indicator collection; patrol debriefs; and other intelligence sources that require corroboration before becoming intelligence to act on. Unmanned aerial systems cannot corroborate some of these reports with imagery collection capabilities only. Unmanned aerial systems will not be able to convey the name of an insurgent cell leader or identify the location of an IED emplaced a week earlier. However, an unmanned aerial system might be able to identify the bed-down location of a cell leader if a brigade has only a description and general location of the cell leader's house. They can also confirm whether people are crossing a river using a footbridge that is submerged just under the water. However, for unmanned aerial systems to identify such information, its operators must have current, refined intelligence that tells them where to look and when and what to confirm or deny.

It does a brigade no good to have unmanned aerial systems observe for potential enemy activity based on the reporting of events that occurred several months before. Intelligence shops must use reports from other collection platforms to develop and update their target decks on a daily basis. Commanders should not allow

their S2 officers to request intelligence, surveillance, and reconnaissance coverage for the same area day after day without significant justification.

In addition, collection managers and unmanned aerial systems leaders must work together to determine how to simplify intelligence, surveillance, and reconnaissance target decks to minimize busy-work for brigade and battalion S2s, decrease lead-time for aerial systems coverage requests, and establish priorities that reward units employing the systems effectively. Unmanned aerial systems operators typically do not require all the information and details contained in most target decks. An operator needs to have a standard mission statement, and that mission will be more effective with a refined intelligence report, which can easily be derived from unit summaries, and important special instructions (e.g. “avoid audible detection”).

Collection managers and unmanned aerial systems leaders must also make a concerted effort to simplify the request process to decrease the time it takes for battalion S2s to submit new target decks. The goal should be intelligence, surveillance, and reconnaissance requests submitted 24 hours before their use and finalized, not including retasks, 12 hours beforehand. Although this will give unmanned aerial units less time to plan their missions, they will receive more accurate and current intelligence. Likewise, collection managers at the corps, division, and brigade level should give full-motion video coverage priority first to units requesting support for ground operations and then to units attempting to confirm or deny information from other sources or collect imagery for upcoming missions.

The third technique units can adopt immediately is to educate platoon and brigade level staff and leaders on the capabilities and limitations of unmanned aerial system platforms and seek feedback on their operations. The Commander of 1st Battalion, 160th Special Operations Aviation Regiment, has noted that Soldiers must understand the importance of all weapons systems on the battlefield to improve performance in combined arms combat.<sup>6</sup> For Soldiers and leaders to adequately understand unmanned aerial systems capabilities, training must go beyond stale “how to use unmanned aerial systems” briefings. Consistent feedback from the leadership on the unit’s ability

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to plan coverage and communicate with operators is necessary to fully understand unmanned aerial system capabilities.

Field Manual 3-24, *Counterinsurgency*, emphasizes the link between intelligence collection and ground operations: “Because intelligence and operations are so closely related, it is important for collectors to be linked directly to the analysts and operators they support.”<sup>7</sup> Unmanned aerial system leaders must coordinate directly with intelligence sections and ground commanders, work with intelligence shops to improve target decks and provide better information to aerial system operators, and coordinate with ground commanders and tactical operations centers during the planning and execution of missions. Before every mission in which unmanned aerial systems directly support ground troops, they should talk directly with the ground commander to coordinate the final details: When is standoff required? What areas, objects, or activities should the unmanned aerial systems identify before troops arrive?

After the mission, unmanned aerial system leaders should elicit the ground commander’s feedback on coverage: When was the unmanned aerial system audible? Did the ground unit directly observe the system feed or did they receive radio reports on it from the system operators or the tactical operations center? Leaders should also tell the supported unit how well they communicate with aerial system operators and suggest how to improve communication for future missions. Adequate feedback requires direct communication between aerial system leaders and the supported unit. It will not suffice to have the supported unit fill out a form or submit an online questionnaire. Coordinating directly with the ground commander immediately before and after a mission only takes a few minutes and is beneficial to both aerial system operators and the troops on the ground.

## Missions Done Well

In certain cases, divisions and echelons below divisions are already implementing these recommendations. Divisions and brigades employ the Shadow aerial system's imagery collection and retransmission capabilities in support of Soldiers conducting signal and human intelligence-driven raids. When my unit conducted such raids in theater, the brigade and supported battalion provided operators access to the latest intelligence packets to ensure they understood the scheme of maneuver for troops on the ground. During human intelligence missions, for example, the operators knew the target house, which routes troops would use to approach the target house, and when standoff was required. During signal intelligence missions, aerial system operators knew the target's general area and received near real-time updates on target activities.

Brigade collection managers and battle captains also implemented measures allowing subordinate units to direct and retask unmanned aerial systems quickly. The brigade collection management team helped identify the most likely areas where ground assault forces would act. The collection manager then ensured that the systems supported imagery collection requests in areas within 20 minutes flight time to the assault force in the event of a retask. Tasking the systems to collect imagery near the assault force's area of operations allowed communications retransmission support between the brigade tactical operations center and ground troops as soon as a raid began.

Successful unmanned aerial systems support to offensive raids also required systems leaders to coordinate with ground units and battalions before, during, and after the mission. Our unmanned aerial systems platoon and collection management trained the supported battalions on how the Shadow and other assets could best support offensive raid missions. Battalions knew how to optimize key Shadow laser pointer and communications retransmission technologies and keep operators informed of the current situation without violating operations security. The unmanned aerial systems platoon also sought feedback from supported ground commanders and the brigade and battalion. This enabled operators to understand better how their performance helped the troops and how they could improve their tactics for future missions.

The successful use of the Shadow while conducting offensive operations suggests some Army units have already implemented the recommendations I discussed above. However, we can do more. Divisions and brigades must work with subordinate units to find offensive missions that benefit from unmanned aerial system coverage, and we must remember that these systems perform missions that do not directly support troops on the ground. Units require intelligence, surveillance, and reconnaissance platforms to confirm or deny enemy actions, collect recent imagery for upcoming missions, and survey areas not adequately covered by ground troops. To optimize the use of imagery collection assets during such missions, Army intelligence and aerial system sections must continually update target decks, shorten system-planning time, and provide continuous feedback to units receiving the coverage.

## Recommendations

The Army must focus on the research and development of future unmanned aerial systems even as it implements immediate changes to improve the effectiveness of systems already in theater. This is particularly important because the recent economic downturn and likely reduction in the defense budget will compel the Army and the Air Force to transfer manned aviation missions to more economical unmanned assets. During a recent Military Officers Association of America symposium, General James Cartwright, Vice Chairman of the Joint Chiefs of Staff, admitted that a short-term solution will be to increase emphasis on equipment such as unmanned aerial vehicles.<sup>8</sup> The Department of Defense will probably find great benefit in improving the capabilities and increasing the production of aerial signal-intelligence platforms, air attack platforms, and communications retransmission platforms.

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In Iraq, our aerial signals-intelligence platforms were generally well employed and never at a loss for a mission. Every asset had a target list that was rarely exhausted. A shortage of aerial coverage meant that ground units only received support if they could send ground forces to apprehend an identified target. Having additional platforms would allow units to further develop a target's pattern of life before attempting to apprehend him, thus allowing the unit to narrow a target's potential hiding locations. Furthermore, including signals intelligence payloads on more unmanned aerial systems with imagery collection capabilities will give the units the ability to observe the terrain of a tactical area of interest and help identify dynamic targets.<sup>9</sup>

The Air Force and Army should also research the possibilities of adding signals intelligence payloads to other unmanned aerial systems not currently used in that capacity. If each brigade combat team, for example, had one Shadow equipped with a signals intelligence package, then it could conduct signal intelligence raids with organic assets. Equipping Shadow vehicles with a signals intelligence payload is not an easy task; it requires adjusting the airframe to allow it to carry a larger payload while emitting a smaller audible signature. However, if the Army can overcome such hurdles, brigade combat teams will significantly improve their lethal targeting capabilities.

Another long-term objective of the Army and the Air Force should be to continue research and development of new unmanned, weaponized systems. The Predator, Sky Warrior, and certain versions of the Hunter can already carry a weapons payload to support by direct fire in the place of manned attack aviation elements like the Air Force's A-10 Thunderbolt II or the Army's AH-64 Apache. One advantage of weaponized unmanned aerial systems is their ability to conduct relatively silent reconnaissance but still act in a support-by-fire role when necessary. This ability already plays a vital role in U.S. Army operations in Afghanistan. Major General Jeffrey Schloesser, the top U.S. commander in eastern Afghanistan, has credited Predator strikes in Waziristan for disrupting insurgent border crossings at the Pakistan border.<sup>10</sup> Given the success of unmanned aerial systems already equipped with aircraft, the Air Force and

the Army should research ways to install weapons on smaller unmanned aerial systems, such as the Shadow or the Hunter, without removing their imagery payloads.

Installing weapons on unmanned aerial systems will benefit troops on the ground. This does not negate one of the key advantages of manned attack aviation—the fact that it is easier for ground troops to communicate directly with pilots conducting close air support missions than it is for them to communicate with unmanned aerial system operators. In January 2009, Colonel Daniel Ball, chief of G3 aviation, U.S. Armed Forces Command, led a panel of Army aviation commanders in a discussion of the commander's perspective of Army aviation in the field. All of the panelists at this conference agreed that there is no substitute for the direct interaction of ground forces and air crews during a reconnaissance mission.<sup>11</sup> Such person-to-person communication does not have to be limited to ground troops communicating with manned aviation crews. The Predator unmanned aerial system, for example, has the ability to perform aerial retransmission, although only when Joint tactical air controllers talk directly to Predator operators to deliver munitions. Some Shadow and Hunter systems have aerial communications retransmission packages that allow troops to communicate directly with system operators or use the systems as a retransmission platform.

In addition to creating direct communication between the ground troops and the unmanned aerial system operators, retransmission packages can also significantly improve the communications range between two ground units operating in different areas. The Army has done a good job of equipping most Shadow systems in theater with a communications relay package that can act as an aerial retransmission site for units up to 200 kilometers apart. However, the Army must work to expand the Shadow retransmission capability so that all Shadow and Hunter systems have it. The Army should also work with Shadow and Hunter contractors to improve the capabilities of the current retransmission package, in particular, to transmit secure communications on both frequency-hop and single-channel frequencies. Thus far, this technology has only been able to transmit securely on single-channel frequencies.

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## Efforts to Optimize Use

Regardless of how the Army and the Air Force appropriate funds for future unmanned aerial systems development, both services will benefit from efforts to optimize use of the systems currently in the Afghanistan and Iraq theaters of operations. Nine months after his speech at Maxwell Air Base, Secretary Gates was still promoting the increased production of unmanned aerial systems. In an article for *Foreign Affairs*, Gates stated that DOD must determine when "it makes sense to employ lower-cost, lower-tech aircraft that can be employed in large quantities and used by U.S. partners."<sup>12</sup> At the strategic level of war, this emphasis is extremely beneficial; the transition from manned aircraft to

unmanned aircraft will reduce human casualties and budget requirements.

However, at the operational and tactical levels of war, commanders must also emphasize the need to improve the use of unmanned aerial systems already in theater. Increasing the size of the U.S. military's unmanned aerial arsenal will take time, and even when complete, it will yield benefits only if Army planners at the division and brigade levels make a concerted effort to optimally employ each system. If Secretary of Defense Gates and his combatant commanders do not compel their subordinate commanders to lead such an effort, then endeavors to increase production of unmanned aerial systems could prove futile. **MR**

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## NOTES

1. Remarks to Air War College, delivered by Secretary of Defense Robert M. Gates, Air Force Base Maxwell, AL: 21 April 2008.

2. Government Accountability Office (GAO), *Unmanned Aircraft Systems: DOD Needs to More Effectively Promote Interoperability and Improve Performance Assessments*, GAO-06-49 (Washington, DC: 13 December 2005); and, GAO, *Unmanned Aircraft Systems: New DOD Programs Can Learn from Past Efforts to Craft Better and Less Risky Acquisition Strategies*, GAO-06-447 (Washington, DC: 15 March 2006); and GAO, *Unmanned Aircraft Systems: Federal Actions Needed to Ensure Safety and Expand Their Potential Uses within the National Airspace System*, GAO-08-511 (Washington, DC: 15 May 2008).

3. GAO, *Unmanned Aircraft Systems: Advanced Coordination and Increased Visibility Needed to Optimize Capabilities*, GAO 07-836 (Washington, DC: 11 July 2007).

4. This was from the Department of Defense's Comments to the GAO recommendations in GAO 07-836 (Appendix II to GAO 07-836) and from a 16 March 2009 phone conversation with Matthew Ullengren of the GAO.

5. Field Manual (FM) 3.04-155: *Army Unmanned Aircraft System Operations*

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6. Jacqueline M. Hames, "Training, UAVs, Key to Army Aviation in the Field," *Army News Service*, 9 January 2009, <<http://www.army.mil/-news/2009/01/09/15645-training-uavs-key-to-army-aviation-in-the-field/>> (5 February 2009).

7. FM 3-24, *Counterinsurgency* (Washington, DC: GPO, 15 December 2006), 3-25.

8. Leo Shane, III, "Pentagon Panel: Military to Face Tough Budget Cuts," *Stars and Stripes*, 19 November 2008.

9. The assertions in this paragraph were based on extensive discussion with CPT Shawn Lonergan, the 2d SCR SIGINT OIC during 2d SCR's deployment to Iraq from August 2007 to November 2008.

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11. Hames.

12. Robert Gates, "A Balanced Strategy: Reprogramming the Pentagon for a New Age," *Foreign Affairs* (January/February 2009), 36.